

## FLAME RETARDANT UREA-BIO BASED URETHANE COMPOSITIONS

This patent application is a ~~continuation-in-part of patent application No. 09/941,402~~  
~~filed 08/30/01, which is a~~ continuation-in-part of 09/532,646 filed 03/22/2000, which is a  
continuation-in-part of 08/801,776 filed 02/14/97, now Patent No. 5,788,915, which is a  
continuation-in-part of 08/723,779 filed 09/30/96 now Patent No. 5,854,309 and a division of  
09/149,847 filed 09/08/98 now Patent No. 6,258,298.

### FIELD

The invention concerns urea compounds and bio based compounds reacted with polyisocyanates to produce flame retarded urethane products. The invention also concerns their preparation and use. The urea compounds with bio based compounds reacted with polyisocyanates are useful to produce flame retardant urethane plastics. The urea compounds and may be reacted with phosphorus and/or boron containing compounds to produce other flame retardant compounds. The urea compounds may also be reacted with aldehydes to produce amino condensation-aldehyde resins for use with bio based compounds a flame retardant urethanes.

### BACKGROUND

The urea and urea compounds produced by heating of urea to produce urea condensation compounds, such as a mixture of urea, biuret, cyanuric acid and cyamelide, is known in the arts, but the use of these compounds with bio based compounds as a flame retardant is novel. The urea condensation compounds and their phosphorus and/or boron salts are used as flame retardant compounds in plastics and natural products. Urea and melamine were utilized as a flame retardant compound by Fracalossi, et al., in U.S. Patent No. 4,385,131. Melamine was utilized as flame retardant compounds in polyurethanes by Yukuta, et al., in U. S.

### Example 1

100 parts by weight of urea is heated to above the melting point of urea and up to about 160 degree C. for 0.1 to 1 hour. Ammonia evolves from the melted urea thereby producing urea condensation composition containing urea, biuret, cyanuric acid and cyamelide. The cooled urea condensation composition is ground into a fine powder or made into an aqueous solution.

### Example 2

20 parts by weight of powdered urea, 40 parts by weight of soy bean oil, 2 parts by weight of water, 1 part by weight of silicone surfactant (DOW 190), 1 part by weight of urethane catalyst (Dabco 33 lv by AIR PRODUCTS) are mixed to form Component B. Component A, 45 parts by weight of polyisocyanate (Mondur MR by BAYER) are mixed with Component B. The mixture expand to form a rigid foam of about 2 lbs./cubic ft.

### Example 3

60 parts by weight of an aqueous solution containing 40% molasses and 20% urea, 1 part by weight of silicone surfactant (DOW 190), 2 parts by weight of dimethylethanolamine, 2 parts by weight of urethane catalyst (Dabco 33 Lv by AIR PRODUCTS), .25 parts by weight of organic tin urethane catalyst are mixed to form Component B. Component B is then mixed with Component A which contains a polyisocyanate (Rubinate 7500 by HUNTSMAN) in the amount of 80 parts by weight. The mixture expand to form a rigid foam of about .5 lbs./cu.ft.

### Example 4

~~Example 2 is modified wherein 75 parts by weight of melamine is used instead of~~

Example 2 and 3 are modified wherein another nitrogen containing compound is added in the amount of 10 parts by weight and selected from the list below:

a) dicyandiamide

k) biuret